

**WHAT IS CLAIMED IS:**

1. A method of carrying out a combustion process, comprising:  
initiating a combustion reaction of a combustion material;  
stimulating one or more components of the combustion material using nuclear  
resonance to alter the oxidation of one or more selected components of the  
combustion reaction;  
sensing one or more operating parameters of the combustion reaction; and  
adjusting the nuclear resonance stimulation based on sensed operating parameters.
2. The method of Claim 1 wherein said stimulating utilizes nuclear magnetic  
resonance.
3. The method of Claim 1 wherein said stimulating utilizes nuclear quadrupole  
resonance.
4. The method of Claim 1 wherein said stimulating stimulates the one or more  
components of the combustion material after the combustion reaction in an exhaust  
stream.
5. The method of Claim 1 wherein said stimulating stimulates the one or more  
components of the combustion material during the combustion reaction in the combustion  
chamber.
6. The method of Claim 1 wherein said stimulating stimulates the one or more  
components of the combustion material before the combustion reaction in an intake.

7. The method of Claim 1 wherein said stimulating stimulates a first component of the combustion material in an intake to the combustion chamber with nuclear magnetic resonance and stimulates a second component of the combustion material in the combustion chamber with nuclear quadrupole resonance.

8. The method of Claim 1 wherein said stimulating emits an electromagnetic signal having a frequency which targets a nuclear resonance frequency of nitrogen-14 in the combustion material.

9. The method of Claim 1 wherein said stimulating emits an electromagnetic signal having a frequency which targets a nuclear resonance frequency of hydrogen-1 in the combustion material.

10. The method of Claim 1 wherein said stimulating emits an electromagnetic pulse which is synchronized with said initiating of the combustion reaction.

11. The method of Claim 1 wherein:  
said stimulating emits an electromagnetic signal having a beginning frequency;  
and  
said adjusting tunes the beginning frequency for the electromagnetic signal.

12. The method of Claim 11 wherein:  
said sensing provides information on one or more gas levels in an exhaust stream;  
and  
said adjusting tunes the beginning frequency based on the gas level information.

13. The method of Claim 11 wherein:  
said sensing provides information on temperature in an exhaust stream; and  
said adjusting tunes the beginning frequency based on the temperature  
information.
14. The method of Claim 11 wherein said adjusting tunes the beginning frequency  
based on a comparison of at least one current operating parameter to a previously-  
recorded operating parameter.

15. A method of carrying out a combustion process, comprising:  
introducing a combustion material into a combustion chamber through an intake;  
initiating a combustion reaction of the combustion material in the combustion  
chamber; and  
5 before said initiating, stimulating one or more components of the combustion  
material while in the intake using nuclear magnetic resonance to increase  
the oxidation of one or more selected components of the combustion  
reaction, wherein said stimulating occurs sufficiently close to the  
combustion chamber such that travel time of the stimulated combustion  
10 material is less than a resonance relaxation time of the one or more  
selected components.

16. The method of Claim 15 wherein said stimulating emits an electromagnetic  
signal having a frequency which targets a nuclear resonance frequency of hydrogen-1 in  
the combustion material.

17. The method of Claim 15 wherein said stimulating emits an electromagnetic  
pulse which is synchronized with said initiating of the combustion reaction.

18. The method of Claim 15 further comprising:  
sensing one or more operating parameters of the combustion reaction; and  
adjusting the nuclear magnetic resonance stimulation based on sensed operating  
parameters.

19. A method of carrying out a combustion process, comprising:  
introducing a combustion material into a combustion chamber;  
initiating a combustion reaction of the combustion material in the combustion  
chamber; and  
5 during the combustion reaction, stimulating one or more components of the  
combustion material while in the combustion chamber using nuclear  
quadrupole resonance to reduce the oxidation of one or more selected  
components of the combustion reaction.
20. The method of Claim 19 wherein said stimulating emits an electromagnetic  
signal having a frequency which targets a nuclear resonance frequency of nitrogen-14 in  
the combustion material.
21. The method of Claim 19 wherein said stimulating emits an electromagnetic  
pulse which is synchronized with said initiating of the combustion reaction.
22. The method of Claim 19 further comprising:  
sensing one or more operating parameters of the combustion reaction; and  
adjusting the nuclear quadrupole resonance stimulation based on sensed operating  
parameters.

23. A method of carrying out a combustion process, comprising:  
introducing a combustion material into a combustion chamber;  
initiating a combustion reaction of the combustion material in the combustion  
chamber; and  
5 after the combustion reaction, stimulating one or more components of the  
combustion material in an exhaust stream using nuclear quadrupole  
resonance to reduce the oxidation of one or more selected components of  
the combustion reaction.

24. The method of Claim 23 wherein said stimulating emits an electromagnetic  
signal having a frequency which targets a nuclear resonance frequency of nitrogen-14 in  
the combustion material.

25. The method of Claim 23 wherein said stimulating emits an electromagnetic  
pulse which is synchronized with said initiating of the combustion reaction.

26. The method of Claim 23 further comprising:  
sensing one or more operating parameters of the combustion reaction; and  
adjusting the nuclear quadrupole resonance stimulation based on sensed operating  
parameters.

27. A combustion apparatus comprising:

a combustion chamber for containing a combustion reaction;

an intake for feeding a combustion material into said combustion chamber;

an exhaust port for carrying an exhaust stream away from said combustion

5 chamber;

a nuclear resonance stimulation source which stimulates one or more components

of the combustion material to alter the oxidation of one or more selected  
components of the combustion reaction;

at least one sensor which senses one or more operating parameters of the

10 combustion reaction; and

a feedback control unit which adjusts said nuclear resonance stimulation source

based on sensed operating parameters.

28. The combustion apparatus of Claim 27 wherein said nuclear resonance  
stimulation source is a nuclear magnetic resonance source.

29. The combustion apparatus of Claim 27 wherein said nuclear resonance  
stimulation source is a nuclear quadrupole resonance source.

30. The combustion apparatus of Claim 27 wherein said nuclear resonance  
stimulation source stimulates the one or more components of the combustion material  
after the combustion reaction in the exhaust stream.

31. The combustion apparatus of Claim 27 wherein said nuclear resonance  
stimulation source stimulates the one or more components of the combustion material  
during the combustion reaction in said combustion chamber.

32. The combustion apparatus of Claim 27 wherein said nuclear resonance stimulation source stimulates the one or more components of the combustion material before the combustion reaction in said intake.

33. The combustion apparatus of Claim 27 wherein said nuclear resonance stimulation source includes a nuclear magnetic resonance source which stimulates a first component of the combustion material in said intake and a nuclear quadrupole resonance source which stimulates a second component of the combustion material in said  
5 combustion chamber.

34. The combustion apparatus of Claim 27 wherein said nuclear resonance stimulation source emits an electromagnetic signal having a frequency which targets a nuclear resonance frequency of nitrogen-14 in the combustion material.

35. The combustion apparatus of Claim 27 wherein said nuclear resonance stimulation source emits an electromagnetic signal having a frequency which targets a nuclear resonance frequency of hydrogen-1 in the combustion material.

36. The combustion apparatus of Claim 27 wherein said nuclear resonance stimulation source emits an electromagnetic pulse which is synchronized with the combustion reaction.

37. The combustion apparatus of Claim 27, further comprising electromagnetic shielding inside combustion chamber which reflects radio frequency signals toward the combustion reaction.



38. The combustion apparatus of Claim 27 wherein:  
said nuclear resonance stimulation source emits an electromagnetic signal having  
a beginning frequency; and  
said feedback control unit adjusts the beginning frequency for the electromagnetic  
5 signal.

39. The combustion apparatus of Claim 38 wherein:  
said sensor provides information on one or more gas levels in an exhaust stream;  
and  
said feedback control unit adjusts the beginning frequency based on the gas level  
5 information.

40. The combustion apparatus of Claim 38 wherein:  
said sensor provides information on temperature in the exhaust stream; and  
said feedback control unit adjusts the beginning frequency based on the  
temperature information.

41. The combustion apparatus of Claim 38 wherein said feedback control unit  
adjusts the beginning frequency based on a comparison of at least one current operating  
parameter to a previously-recorded operating parameter.

42. A combustion apparatus comprising:

a combustion chamber for containing a combustion reaction;

an intake for feeding a combustion material into said combustion chamber;

a nuclear magnetic resonance stimulation source which stimulates one or more

5                    components of the combustion material while in said intake before the  
                     combustion reaction to increase the oxidation of one or more selected  
                     components of the combustion reaction, said nuclear magnetic resonance  
                     stimulation source being sufficiently close to said combustion chamber  
                     such that travel time of the stimulated combustion material is less than a  
10                   resonance relaxation time of the one or more selected components.

43. The combustion apparatus of Claim 42 wherein said nuclear magnetic  
resonance stimulation source emits an electromagnetic signal having a frequency which  
targets a nuclear resonance frequency of hydrogen-1 in the combustion material.

44. The combustion apparatus of Claim 42 wherein said nuclear magnetic  
resonance stimulation source emits an electromagnetic pulse which is synchronized with  
the combustion reaction.

45. The combustion apparatus of Claim 42, further comprising:

at least one sensor which senses one or more operating parameters of the  
                     combustion reaction; and

a feedback control unit which adjusts said nuclear magnetic resonance stimulation  
5                   source based on sensed operating parameters.

46. A combustion apparatus comprising:  
a combustion chamber for containing a combustion reaction of a combustion material; and  
a nuclear quadrupole resonance stimulation source which stimulates one or more  
5 components of the combustion material while in said combustion chamber during the combustion reaction to reduce the oxidation of one or more selected components of the combustion reaction.

47. The combustion apparatus of Claim 46 wherein said nuclear quadrupole resonance stimulation source emits an electromagnetic signal having a frequency which targets a nuclear resonance frequency of nitrogen-14 in the combustion material.

48. The combustion apparatus of Claim 46 wherein said nuclear quadrupole resonance stimulation source emits an electromagnetic pulse which is synchronized with the combustion reaction.

49. The combustion apparatus of Claim 46, further comprising:  
at least one sensor which senses one or more operating parameters of the combustion reaction; and  
a feedback control unit which adjusts said nuclear magnetic quadrupole  
5 stimulation source based on sensed operating parameters.

50. A combustion apparatus comprising:

a combustion chamber for containing a combustion reaction of a combustion material; and

an exhaust port for carrying an exhaust stream away from said combustion chamber; and

a nuclear quadrupole resonance stimulation source which stimulates one or more components of the combustion material in the exhaust stream after the combustion reaction to reduce the oxidation of one or more selected components of the combustion reaction.

51. The combustion apparatus of Claim 50 wherein said nuclear quadrupole resonance stimulation source emits an electromagnetic signal having a frequency which targets a nuclear resonance frequency of nitrogen-14 in the combustion material.

52. The combustion apparatus of Claim 50 wherein said nuclear quadrupole resonance stimulation source emits an electromagnetic pulse which is synchronized with the combustion reaction.

53. The combustion apparatus of Claim 50, further comprising:

at least one sensor which senses one or more operating parameters of the combustion reaction; and

a feedback control unit which adjusts said nuclear magnetic quadrupole stimulation source based on sensed operating parameters.

54. A feedback control unit for a nuclear resonance stimulation source which enhances a combustion reaction, comprising:

5           one or more inputs for receiving sensory data relating to the combustion reaction;  
          control logic which examines the sensory data to determine an operational  
          adjustment factor for the nuclear resonance stimulation source; and  
          an output which provides a signal indicative of the operational adjustment factor.

55. The feedback control unit of Claim 54 wherein the nuclear resonance stimulation source emits an electromagnetic signal having a beginning frequency, and said control logic adjusts the beginning frequency for the electromagnetic signal.

56. The feedback control unit of Claim 55 further comprising a user interface which allows the beginning frequency to be programmably set.

57. The feedback control unit of Claim 56 wherein said user interface further allows a frequency adjustment value to be programmably set.

58. The feedback control unit of Claim 55 wherein the sensory data relates to information on one or more gas levels in an exhaust stream, and said control logic adjusts the beginning frequency based on the gas level information.

59. The feedback control unit of Claim 55 wherein the sensory data relates to information on temperature in an exhaust stream, and said control logic adjusts the beginning frequency based on the temperature information.

60. The feedback control unit of Claim 55 wherein said control logic adjusts the beginning frequency based on a comparison of current sensory data to previously-recorded sensory data.